UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/568,461	02/15/2006	Yasuo Kobayashi	33082M300	1005

441 7590 03/30/2007
SMITH, GAMBRELL & RUSSELL
1850 M STREET, N.W., SUITE 800
WASHINGTON, DC 20036

EXAMINER	
PATEL, REEMA	
ART UNIT	PAPER NUMBER
2812	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/568,461	KOBAYASHI ET AL.	
	Examiner	Art Unit	
	Reema Patel	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 February 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 February 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/15/06,5/18/06,7/11/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The information disclosure statements (IDS) were submitted on 2/15/05, 5/18/06, and 7/11/06. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements have been considered by the examiner.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 1-5 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Sugahara et al. (U.S. 5,989,998).

5. Regarding claim 1, Sugahara et al. discloses a semiconductor device comprising an insulation film consisting of a fluoridation carbon film that has been subjected to thermal history of 420 °C or lower, wherein an amount of hydrogen atoms included in the fluoridation carbon film is 3 atomic % or less before the fluoridation carbon film is subjected to the thermal history (col 13, lines 12-20, 27-30, 37-41).

6. Regarding claim 2, Sugahara et al. discloses that the insulation film is an interlayer insulation film (col 13, lines 12-17).

7. Regarding claim 3, Sugahara et al. discloses a manufacturing method of a semiconductor device comprising the steps of:

- generating a plasma of a source gas consisting of a chemical compound of carbon and fluorine and including hydrogen atoms of 1×10^{-3} atomic % or less (col 13, lines 15-18)
- forming an insulating film consisting of a fluoridation carbon film that includes hydrogen atoms of 3 atomic % or less, on a substrate, by using the plasma of the source gas (col 13, lines 12-20, 27-30)

8. Regarding claim 4, Sugahara et al. discloses heating the substrate at a temperature of 420 °C or lower, after the step of forming the insulation film (col 13, lines 37-41).

9. Regarding claim 5, Sugahara et al. discloses the use of a fluorinated carbon compound, which has a triple bond of the carbon atoms (col 4, lines 50-55). Since the formula C_5F_8 can encompass a linear structure containing one triple bond between carbon atoms, Sugahara et al. anticipates the use of C_5F_8 as the as the fluorinated carbon compound.

10. Regarding claim 12, Sugahara et al. discloses a gas for a plasma CVD process, comprising an unsaturated carbon fluoride compound and hydrogen atoms in the amount of 1×10^{-3} atomic % or lower (col 13, lines 59-65).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 6-7, 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugahara et al. (U.S. 5,989,998) in view of Robles et al. (U.S. 6,035,803).

13. Regarding claim 6, Sugahara et al. discloses a gas for a plasma CVD process, comprising an unsaturated carbon fluoride compound and a chemical compound including a hydrogen atom (col 2 lines 28-32, col 4 lines 20-27) but is silent regarding the concentration of the chemical compound including the hydrogen atom. However, Robles et al. discloses lowering the concentration of the chemical compound including the hydrogen atom lowers the dielectric constant of the insulating film (col 12, lines 62-65). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a lower concentration of the chemical compound including the hydrogen atom, such as 90 ppm by weight or less, so as to produce an insulating film with a desirably low dielectric constant.

14. Regarding claim 7, Sugahara et al. discloses a gas for a plasma CVD process, comprising an unsaturated carbon fluoride compound and a chemical compound including a hydrogen atom (col 2 lines 28-32, col 4 lines 20-27) but is silent regarding the concentration of the chemical compound including the hydrogen atom. However, Robles et al. discloses lowering the concentration of the chemical compound including

the hydrogen atom lowers the dielectric constant of the insulating film (col 12, lines 62-65). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a lower concentration of the chemical compound including the hydrogen atom, such as 10 ppm by weight or less, so as to produce an insulating film with a desirably low dielectric constant.

15. Regarding claim 9, Sugahara et al. discloses the unsaturated carbon fluoride compound hexafluoro-1,3-butadiene (col 13, lines 59-65).

16. Regarding claim 10, Sugahara et al. discloses bringing a composition of an unsaturated carbon fluoride compound and a chemical compound including a hydrogen atom in contact with burned adsorbent (col 13, lines 66-67, col 4, lines 1-8).

17. Regarding claim 11, Sugahara et al. discloses conducting a plasma CVD process by using the gas for the plasma CVD process according to any of claims 6 to 8 (col 2, lines 28-32).

18. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugahara et al. (U.S. 5,989,998) in view of Robles et al. (U.S. 6,035,083) as applied to claim 6 above, and further in view of Ravi et al. (U.S. 5,661,093).

19. Regarding claim 8, Sugahara et al. in view of Robles et al. discloses the limitations of claim 6 but is silent regarding the concentration of water. According to Ravi et al., the presence of water increases the dielectric constant of an insulating film (col 10, lines 30-31). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to a use a concentration of water of

3 ppm by weight or less so as not to undesirably increase the dielectric constant of the insulating film.

20. Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugahara et al. (U.S. 5,989,998) in view of Ravi et al. (U.S. 5,661,093)

21. Regarding claim 13, Sugahara et al. discloses a gas for a plasma CVD process, comprising an unsaturated carbon fluoride compound (col 13, lines 59-67, col 14, lines 1-8) but is silent regarding the concentration of water. According to Ravi et al., the presence of water increases the dielectric constant of an insulating film (col 10, lines 30-31). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to a use a concentration of water of 0.5 ppm by weight or less so as not to undesirably increase the dielectric constant of the insulating film.

22. Regarding claim 14, Sugahara et al. is silent regarding the concentration of water. However, according to Ravi et al., the presence of water increases the dielectric constant of an insulating film (col 10, lines 30-31). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to a use a concentration of water of 0.1 ppm by weight or less so as not to undesirably increase the dielectric constant of the insulating film.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Reema Patel whose telephone number is 571-270-1436. The examiner can normally be reached on M-F, 8:00-4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RSP
3/27/07

SCOTT B. GEYER
PRIMARY EXAMINER

3/28/07